



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/599,921	10/13/2006	Hiroshi Yoshida	188482/US-465122-00030	6597

30873 7590 01/19/2011
DORSEY & WHITNEY LLP
INTELLECTUAL PROPERTY DEPARTMENT
250 PARK AVENUE
NEW YORK, NY 10177

EXAMINER

JANAKIRAMAN, NITHYA

ART UNIT	PAPER NUMBER
----------	--------------

2123

MAIL DATE	DELIVERY MODE
-----------	---------------

01/19/2011

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/599,921	Applicant(s) YOSHIDA ET AL.	
	Examiner NITHYA JANAKIRAMAN	Art Unit 2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 November 2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 9-40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 9-40 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 October 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This action is in response to the submission filed on 11/22/2010. Claims 9-40 are presented for examination.

Response to Arguments- 35 USC § 103

1. Applicant's arguments filed 11/22/2010 have been fully considered but they are not persuasive.

Argument 1:

2. Applicant argue on page 20-22 that the prior art does not teach the fracture limit line created as a curve.
3. In mathematics, a curve (sometimes also called a curved line) is an object similar to a line but which is not required to be straight, and a line is a special case of curve (a curve with zero curvature). The fracture limit line is taught by Jiang on page 1519, “a **linear fracture limit line** could be drawn in an ϵ_θ - ϵ_z plane (where ϵ_θ is the circumferential strain and ϵ_z is the local axial strain) by linking the fracture points measured on the cylindrical surfaces of specimens, this line being approximately parallel to the line ϵ_θ - $\epsilon_z/2$, which represents the strain path for homogeneous compression”. Jiang teaches a fracture limit line, therefore Jiang teaches a fracture limit curve with zero curvature.

Argument 2:

4. Applicant argues on pages 23-24 that the proposed combination is not possible “unless the database is infinitely expanded for each of various test models and load models” and that it

Art Unit: 2123

would "require a very fine mesh division model", and that "an accuracy problem can occur by mesh division".

5. Applicant has provided no evidence for these statements, aside from the blanket assertion that the proposed combination would not have been attempted. The Chao reference's entire inventive concept centers on discovering the failure load and fractures of spot welds when subjected to shear and tensile loads. Page 126 states that the study is geared towards developing "an analytical solution for **predicting** the ultimate strength of spot weld". Chao already charts the failure rate of a variety of loads (Figures 14, 15, 17). An obvious extension of the Chao reference would be to take the inputs of the normal and shear tests and derive a fracture limit line. One of ordinary skill in the art would, in the course of experimentation, graph the inputs vs. the outputs of a stress test, according to a derived formula. Rejection maintained.

Argument 3:

6. Applicant argues on page 25 that Bai is related to the field of interfacial strength in glass bead filled HDPE, and not related to spot welding.

7. The stress concentration formula is not limited to the field of glass beads, is widely known, and is capable of being used in any field of material science, when stress in a particular material is being examined. Chao, Jiang, and Bai are all related to the field of material strength. Rejection maintained.

Art Unit: 2123

Claim Objections

8. Claims 33-36 are objected to because of the following informalities: Applicant states in the Remarks that claims 33-36 have been cancelled. However, the claim set does not indicate any new cancellations. As such, claims 33-36 do not further limit their parent claims, as they repeat subject matter found in their parent claims. Applicant is advised to clearly cancel claims 33-36.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 10-32 and 37-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over “Ultimate Strength and Failure Mechanism of Resistance Spot Weld Subjected to Tensile, Shear, or Combined Tensile/Shear Loads” (“Chao”) in view of “Large Cold Plastic deformation of metal-matrix composites reinforced by SiC particles” (“Jiang”).

Art Unit: 2123

11. Chao discloses a fracture prediction device for use with a spot welded portion. However, Chao does not disclose a fracture limit line.

12. Jiang does disclose this (see page 1519).

13. Chao and Jiang are analogous art as they are both related to the field of stress fractures in materials.

14. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the fracture limit line of Jiang with the fracture prediction device of Chao, motivated by the desire to "to study the workability of ductile materials by examining the free-surface strain histories until fracture occurred" (see Jiang, page 1519).

15. Regarding claim 10, Chao and Jiang teach:

A fracture prediction device provided for a spot welded portion (*Chao: Introduction*, "predict the failure strength of a spot weld), comprising:

an input arrangement configured to input **at least one of** a material strength, a plate thickness, a nugget diameter of a spot welding, a plate width of a particular joint, or a rotation angle (*Chao: Table 1*, "Thickness of the sheet", "Nominal Nugget Diameter") of the joint plates in a tension testing procedure which is at least one of a cross tension testing procedure or a shear tension testing procedure at a spot welded joint (*Chao: Abstract*, "lap-shear and cross tension test samples");

Art Unit: 2123

a first calculation arrangement configured to determine a fracture strength parameter in **at least one** of a cross tension or a shear tension based (*Chao: Abstract, "lap-shear and cross tension test samples"*) on a fracture strength curve of the spot welded portion (*Chao: Introduction, "curve fitted to a force based criterion for design consideration"*; Figure 1) obtained from **at least one** of the material strength, the plate thickness, the nugget diameter of the spot welding, the plate width of the joint, or the rotation angle of the particular joint in the tension testing procedure (*Chao: Table 1, "Thickness of the sheet", "Nominal Nugget Diameter"*);

a parameter storage arrangement configured to store the fracture strength parameter by each steel type (*Chao: Section 7, "from plain carbon steel to HSLA and the test sample geometries include cross tension, lap-shear, coach peel as well as in-plane torsion"*); and

a second calculation arrangement configured to analyze a fracture of the spot welded portion by providing the fracture strength parameter stored in the parameter storage arrangement (*Chao: Abstract, "Data from strength tests as well as finite element numerical method are used to validate the model. Finally, the utility of the model in accessing the failure strength of spot welds is discussed"*) into a fracture limit line (*Jiang: page 1519, "a linear fracture limit line could be drawn in an ε_θ - ε_z plane (where ε_θ is the circumferential strain and ε_z is the local axial strain) by linking the fracture points measured on the cylindrical surfaces of specimens, this line being approximately parallel to the line ε_θ - $\varepsilon_z/2$, which represents the strain path for homogeneous compression"*) in which a deformation at a periphery of the spot welding portion is modeled by a finite element procedure (*Chao: Table 2, "finite element analysis"*),

Art Unit: 2123

wherein the fracture limit line is created on a curve (Chao: Introduction, “*curve fitted to a force based criterion for design consideration*”; Figure 1; Jiang: page 1519, “*a linear fracture limit line could be drawn in an ε_θ - ε_z plane (where ε_θ is the circumferential strain and ε_z is the local axial strain) by linking the fracture points measured on the cylindrical surfaces of specimens, this line being approximately parallel to the line ε_θ - $\varepsilon_z/2$, which represents the strain path for homogeneous compression*”) is based on a shear force and a vertical force with respect to the spot welded portion (Chao: page 131, “*Mixed Normal/Shear Loading*”, “*Having the stress distributions developed for spot weld subjected to normal force, i.e., cross tension sample, and shear force, i.e., lap-shear sample, an extension to mixed normal/shear loading conditions is investigated in this section. The analytical result is then compared with test data. For spot weld loaded with a combination of normal and shear forces*”).

16. Regarding claim 19, Chao and Jiang teach:

The fracture prediction device of claim 10, wherein the shear force is provided in a direction along a member surface of an element that connects members with each other in which the spot welding is modeled, and the vertical force is provided in a direction that connects members with each other orthogonally to the shear force (Chao: page 131, “*Mixed Normal/Shear Loading*”, “*Having the stress distributions developed for spot weld subjected to normal force, i.e., cross tension sample, and shear force, i.e., lap-shear sample, an extension to mixed normal/shear loading conditions is investigated in this section. The analytical result is then compared with test data. For spot weld loaded with a combination of normal and shear forces*”).

Art Unit: 2123

17. Regarding claim 20, Chao and Jiang teach:

The fracture prediction device of claim 10, wherein the shear force is determined one after another during a deformation of a collision analysis reproduced using the finite element procedure (Chao: *Abstract*, “*finite element numerical method are used to validate the model*”, page 130, “*detailed finite element analyses for spot weld subjected to mixed far field normal/shear load*”).

18. Regarding claim 37, Chao and Jiang teach:

The fracture prediction device of claim 10, wherein the fracture strength curve provides a graphic representation written by measuring the fracture strength parameter by a test in which at least one of the material strength, the plate thickness, the nugget diameter of the spot welding, the plate width of the joint, or the rotation angle of the particular joint in the tension testing procedure are varied (Chao: *Table 1*, “*Thickness of the sheet*”, “*Nominal Nugget Diameter*”).

19. Claims 11-18, 21-32, and 38-40 are rejected for almost identical reasoning as above.

Art Unit: 2123

20. Claims 9 and 33-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chao, in view of Jiang, further in view of “The role of the interfacial strength in glass bead filled HDPE” (“Bai”).

21. Chao in view of Jiang teaches a fracture prediction device for use with a spot welded portion. However, Chao in view of Jiang does not teach a stress concentration factor. Bai does teach this.

22. Chao, Jiang, and Bai are all analogous art as they are all related to the field of materials strength.

23. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the stress concentration factor of Bai with the fracture prediction device of Chao in view of Jiang, motivated by the desire to quantify the strength of various materials, which is obviously desirable to one of ordinary skill.

24. Regarding claim 9, Chao, Jiang and Bai teach:

A fracture prediction device provided for a spot welded portion (Chao: *Introduction*, “predict the failure strength of a spot weld”), comprising:

an input arrangement configured to input **at least one of** a material strength, a plate thickness, a nugget diameter of a spot welding, a plate width of a particular joint, or a rotation angle (Chao: *Table 1*, “*Thickness of the sheet*”, “*Nominal Nugget Diameter*”) of the joint plates in a tension testing procedure which is at least one of a cross tension testing procedure or a shear tension

Art Unit: 2123

testing procedure at a spot welded joint (Chao: *Abstract*, “lap-shear and cross tension test samples”);

a first calculation arrangement configured to determine a fracture strength parameter in **at least one** of a cross tension or a shear tension based (Chao: *Abstract*, “lap-shear and cross tension test samples”) based on a stress concentration factor σ and **at least one** of the inputted material strength, the plate thickness, the nugget diameter of the spot welding, the plate width of the joint, or the rotation angle of the particular joint in the tension testing procedure (Chao: Table 1, “Thickness of the sheet”, “Nominal Nugget Diameter”) wherein the stress concentration factor σ is at least **one of** (i) defined by a formula of (tensile strength TS)/(mean tensile strength σ_0) (Bai: page 1588, “Here, σ_{cr} is the macroscopic average tensile stress at the moment of the interfacial debonding...The relation between σ_{cr} and σ_i can be expressed as: $\sigma_i = \eta\sigma_{cr}$, where η is the stress concentration factor in the polar region of the interface and depends on the size, distribution and volume fraction of particles”; solving the equation for η provides the claimed formula) or (ii) calculated using a stress concentration factor calculation formula;

a parameter storage arrangement configured to store the fracture strength parameter by each steel type (Chao: Section 7, “from plain carbon steel to HSLA and the test sample geometries include cross tension, lap-shear, coach peel as well as in-plane torsion”); and

Art Unit: 2123

a second calculation arrangement configured to analyze a fracture of the spot welded portion by providing the fracture strength parameter stored in the parameter storage arrangement (Chao: Abstract, "Data from strength tests as well as finite element numerical method are used to validate the model. Finally, the utility of the model in accessing the failure strength of spot welds is discussed") into a fracture limit line (Jiang: page 1519, "*a linear fracture limit line could be drawn in an ε_θ - ε_z plane (where ε_θ is the circumferential strain and ε_z is the local axial strain) by linking the fracture points measured on the cylindrical surfaces of specimens, this line being approximately parallel to the line ε_θ - $\varepsilon_z/2$, which represents the strain path for *homogeneous compression*)* in which a deformation at a periphery of the spot welding portion is modeled by a finite element procedure (Chao: Table 2, "*finite element analysis*"),

wherein the fracture limit line (Jiang: page 1519, "*a linear fracture limit line could be drawn in an ε_θ - ε_z plane (where ε_θ is the circumferential strain and ε_z is the local axial strain) by linking the fracture points measured on the cylindrical surfaces of specimens, this line being approximately parallel to the line ε_θ - $\varepsilon_z/2$, which represents the strain path for homogeneous compression*") is based on a shear force and a vertical force with respect to the spot welded portion (Chao: page 131, "*Mixed Normal/Shear Loading*", "*Having the stress distributions developed for spot weld subjected to normal force, i.e., cross tension sample, and shear force, i.e., lap-shear sample, an extension to mixed normal/shear loading conditions is investigated in this section. The analytical result is then compared with test data. For spot weld loaded with a combination of normal and shear forces*").

Art Unit: 2123

25. Regarding claim 33, Chao, Jiang, and Bai:

The fracture prediction device of claim 9, wherein the fracture strength parameter is determined based on a stress concentration factor a defined by (tensile strength TS) / (mean tensile stress σ_o) (*Bai: page 1588, "Here, σ_{cr} is the macroscopic average tensile stress at the moment of the interfacial debonding...The relation between σ_{cr} and σ_i can be expressed as: $\sigma_i = \eta\sigma_{cr}$, where η is the stress concentration factor in the polar region of the interface and depends on the size, distribution and volume fraction of particles"; solving the equation for η provides the claimed formula).*

26. Claims 34-36 are rejected for almost identical reasoning as above.

- While only certain citations have been given, Applicant should consider the reference in its entirety.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NITHYA JANAKIRAMAN whose telephone number is (571)270-1003. The examiner can normally be reached on Monday-Thursday, 8:00am-5:00pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez can be reached on (571)272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

Art Unit: 2123

applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Nithya Janakiraman/
Examiner, Art Unit 2123

/Jason Proctor/
Primary Examiner, Art Unit 2123